Younce describes an echo canceller circuit that includes a digital filter having adaptive tap coefficients to simulate an echo response occurring during a call. The adaptive tap coefficients are updated during the call using a Mean Squares or a least squares process. A tap energy detector is also employed. The tap energy detector identifies and divides groups of taps having high energy from groups of taps having low energy. The high energy tap groups are generally smaller in number than the low energy tap groups. The high energy tap groups are adapted separately from the low energy tap groups… the high energy tap groups may be adapted using an adaptive gain constant while the low energy tap groups are adapted using an adaptive gain constant.

Thus, Younce describes a circuit wherein both the high energy tap groups and low energy tap groups are adapted to perform echo cancellation. In contrast, claims 1, 9 and 17 now recite "…detecting active regions of an echo channel impulse response; and filtering *only portions of the received signal corresponding to the active regions of the echo channel impulse response* using a first set of filter coefficients *to cancel the echo component of the received* signal…" Thus, the claims 1, 9 and 17 cancel the echo component of the received signal by adapting only the portion of the signal identified as the active region. Such an arrangement is neither described nor suggested by Younce, and thus the claims are patentably distinct over Younce, and the rejection should be withdrawn.

The Examiner has indicated that claims 2-8 and 10-16 would be allowable if re-written in independent form including all the limitations of the base claim and any intervening claims. As applicants believe that claims 1, 9 and 17 are now patentable, the claims have not been re-

written. However, claims 18-31 recite the limitations of claims 2-8, and 10-16 indicated as allowable by the Examiner. For example, claims 18 is essentially the previous version of claim 1, re-written to include the limitations of claim 2 deemed allowable by the Examiner.

Applicants have made a diligent effort to place the claims in condition for allowance. However, should there remain unresolved issues that require adverse action, it is respectfully requested that the Examiner telephone Lindsay G. McGuinness, Applicants' Attorney at 978-264-6664 so that such issues may be resolved as expeditiously as possible.

For these reasons, and in view of the above amendments, this application is now considered to be in condition for allowance and such action is earnestly solicited.

Respectfully Submitted,

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Date

Lindsay G. McGuinness
Lindsay G. McGuinness, Reg. No. 38,549
Attorney/Agent for Applicant(s)
Steubing McGuinness & Manaras LLP
125 Nagog Park Drive
Acton, MA 01720
(978) 264-6664

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CLAIMS

1. (Currently amended) A method for canceling an echo component of a received signal, the method comprising:

detecting active regions of an echo channel impulse response; and filtering <u>only portions of</u> the <u>received</u> signal corresponding to the active regions of the echo channel impulse response using a first set of filter coefficients <u>to cancel the echo component of the received signal</u>.

2. (original) The method of claim 1, wherein detecting active regions of the echo channel impulse response comprises:

computing an estimate of the echo channel impulse response using a number of short finite impulse response filters represented by a second set of filter coefficients;

computing an average error for each short finite impulse response filter; and identifying up to L short finite impulse response filters having a lowest average errors, where L is a predetermined maximum number of reflections tracked by the echo canceller.

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3. (original) The method of claim 2, wherein filtering the signal corresponding to the active regions of the echo channel impulse response:

transferring to the first set of filter coefficients those filter taps from the second set of filter coefficients corresponding to at least one short finite impulse response filter having the lowest average error.

4. (original) The method of claim 3, wherein transferring to the first set of filter coefficients those filter taps from the second set of filter coefficients corresponding to at least one short finite impulse response filter having the lowest average error comprises:

initially transferring two short finite impulse response filters having the lowest average errors from the second set of filter coefficients to the first set of filter coefficients; and

subsequently transferring short finite impulse response filters having the lowest average errors one at a time from the second set of filter coefficients to the first set of filter coefficients.

5. (original) The method of claim 3, further comprising:

distributing a number of additional filter taps equally among the two reflections having the highest tap powers modeled by the first set of filter coefficients.

6. (original) The method of claim 1, further comprising:

computing a first average error using all reflections modeled by the first set of filter coefficients;

computing a second average error using all reflections modeled by the first set of filter coefficients except the lowest power reflection; and

removing the lowest power reflection from the first set of filter coefficients if the second average error is smaller than the first average error.

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7. (original) The method of claim 6, further comprising:

distributing the filter taps associated with the removed lowest power reflection among the remaining reflections modeled by the first set of filter coefficients.

8. (original) The method of claim 1, further comprising:

tracking reflections in the filtered echo channel impulse response using the first set of filter coefficients; and

revising the first set of filter coefficients based upon the filter tap powers of the corresponding reflection.

9. (Currently amended) An echo canceller <u>for canceling an echo component of a received signal</u> comprising active tap detection logic operably coupled to filter <u>only a portion of</u> the <u>received</u> signal corresponding to the active regions of an echo channel impulse response using a first set of filter coefficients <u>to cancel the echo component of the received signal</u>, track the change in the location of each reflection <u>of the received signal</u> using a <u>the</u> first set of filter coefficients, and detect active regions of the echo channel impulse response using a second set of filter coefficients.

10. (original) The echo canceller of claim 9, wherein the active tap detection logic is operably coupled to compute an estimate of the echo channel impulse response using a number of short finite impulse response filters represented by a second set of filter coefficients, compute an average error for each short finite impulse response filter, and identify up to L short finite impulse response filters having a lowest average errors, where L is a predetermined maximum number of reflections tracked by the echo canceller.

11. (original) The echo canceller of claim 10, wherein the active tap detection logic is operably coupled to transfer to the first set of filter coefficients those filter taps from the second set of filter coefficients corresponding to the L short finite impulse response filters having the lowest average errors.

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12. (original) The echo canceller of claim 11, wherein transferring of filter coefficients is performed by initially transferring 2 short finite impulse response filters having the lowest average errors and then transferring short finite impulse responses having the lowest average error one at a time, up to L short finite impulse response.

13. (original) The echo canceller of claim 12, wherein the active tap detection logic is operably coupled to distribute a number of additional filter taps equally among the two reflections having the highest tap powers modeled by the first set of filter coefficients.

14. (original) The echo canceller of claim 9, wherein the active tap detection logic is operably coupled to compute a first average error using all reflections modeled by the first set of filter coefficients, compute a second average error using all reflections modeled by the first set of filter coefficients except the lowest power reflection, and remove the lowest power reflection from the first set of filter coefficients if the second average error is smaller than the first average error.

15. (original) The echo canceller of claim 14, wherein the active tap detection logic is operably coupled to distribute the filter taps associated with the removed lowest power reflection among the remaining reflections modeled by the first set of filter coefficients.

16. (original) The echo canceller of claim 10, wherein the active tap detection logic is operably coupled to track reflections in the filtered echo channel impulse response using the first set of filter coefficients by comparing filter tap powers in each reflection.

17. (Currently amended) An echo canceller for canceling an echo component of a received signal comprising means for detecting, tracking, and filtering ~~the~~ only a portion of the received signal contributed to by ~~the~~ active regions of an echo channel impulse response.

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18. (New) A method for canceling an echo component of a received signal, the method comprising:

detecting active regions of an echo channel impulse response; and filtering the signal corresponding to the active regions of the echo channel impulse response using a first set of filter coefficients;

computing an estimate of the echo channel impulse response using a number of short finite impulse response filters represented by a second set of filter coefficients;

computing an average error for each short finite impulse response filter; and identifying up to L short finite impulse response filters having a lowest average errors, where L is a predetermined maximum number of reflections tracked by the echo canceller.

19. (New) The method of claim 18, wherein filtering the signal corresponding to the active regions of the echo channel impulse response:

transferring to the first set of filter coefficients those filter taps from the second set of filter coefficients corresponding to at least one short finite impulse response filter having the lowest average error.

20. (New) The method of claim 19, wherein transferring to the first set of filter coefficients those filter taps from the second set of filter coefficients corresponding to at least one short finite impulse response filter having the lowest average error comprises:

initially transferring two short finite impulse response filters having the lowest average errors from the second set of filter coefficients to the first set of filter coefficients; and

subsequently transferring short finite impulse response filters having the lowest average errors one at a time from the second set of filter coefficients to the first set of filter coefficients.

21. (New) The method of claim 19, further comprising:

distributing a number of additional filter taps equally among the two reflections having the highest tap powers modeled by the first set of filter coefficients.

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22. (New) A method for canceling an echo component of a received signal, the method comprising:

detecting active regions of an echo channel impulse response; and filtering the signal corresponding to the active regions of the echo channel impulse response using a first set of filter coefficients;

computing a first average error using all reflections modeled by the first set of filter coefficients;

computing a second average error using all reflections modeled by the first set of filter coefficients except the lowest power reflection; and

removing the lowest power reflection from the first set of filter coefficients if the second average error is smaller than the first average error.

23. (New) The method of claim 22, further comprising:

distributing the filter taps associated with the removed lowest power reflection among the remaining reflections modeled by the first set of filter coefficients.

24. (New) The method of claim 22, further comprising:

tracking reflections in the filtered echo channel impulse response using the first set of filter coefficients; and

revising the first set of filter coefficients based upon the filter tap powers of the corresponding reflection.

25. (New) An echo canceller comprising active tap detection logic operably coupled to filter the signal corresponding to the active regions of an echo channel impulse response using a first set of filter coefficients, track the change in the location of each reflection using a first set of filter coefficients, and detect active regions of the echo channel impulse response using a second set of filter coefficients, wherein the active tap detection logic is operably coupled to compute an estimate of the echo channel impulse response using a number of short finite impulse response filters represented by a second set of filter coefficients, compute an average error for each short finite impulse response filter, and identify up to L short finite impulse response filters having a lowest average errors, where L is a predetermined maximum number of reflections tracked by the echo canceller.

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26. (New) The echo canceller of claim 25, wherein the active tap detection logic is operably coupled to transfer to the first set of filter coefficients those filter taps from the second set of filter coefficients corresponding to the L short finite impulse response filters having the lowest average errors.

27. (original) The echo canceller of claim 26, wherein transferring of filter coefficients is performed by initially transferring 2 short finite impulse response filters having the lowest average errors and then transferring short finite impulse responses having the lowest average error one at a time, up to L short finite impulse response.

28. (New) The echo canceller of claim 27, wherein the active tap detection logic is operably coupled to distribute a number of additional filter taps equally among the two reflections having the highest tap powers modeled by the first set of filter coefficients.

29. (New) An echo canceller comprising active tap detection logic operably coupled to filter the signal corresponding to the active regions of an echo channel impulse response using a first set of filter coefficients, track the change in the location of each reflection using a first set of filter coefficients, and detect active regions of the echo channel impulse response using a second set of filter coefficients, wherein the active tap detection logic is operably coupled to compute a first average error using all reflections modeled by the first set of filter coefficients, compute a second average error using all reflections modeled by the first set of filter coefficients except the lowest power reflection, and remove the lowest power reflection from the first set of filter coefficients if the second average error is smaller than the first average error.

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30. (New) The echo canceller of claim 29, wherein the active tap detection logic is operably coupled to distribute the filter taps associated with the removed lowest power reflection among the remaining reflections modeled by the first set of filter coefficients.

31. (New) The echo canceller of claim 29, wherein the active tap detection logic is operably coupled to track reflections in the filtered echo channel impulse response using the first set of filter coefficients by comparing filter tap powers in each reflection.